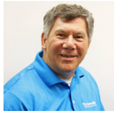
Broader Definition Of Pump-drive System Efficiency Promts Municipalities To Reconsider Drive Options



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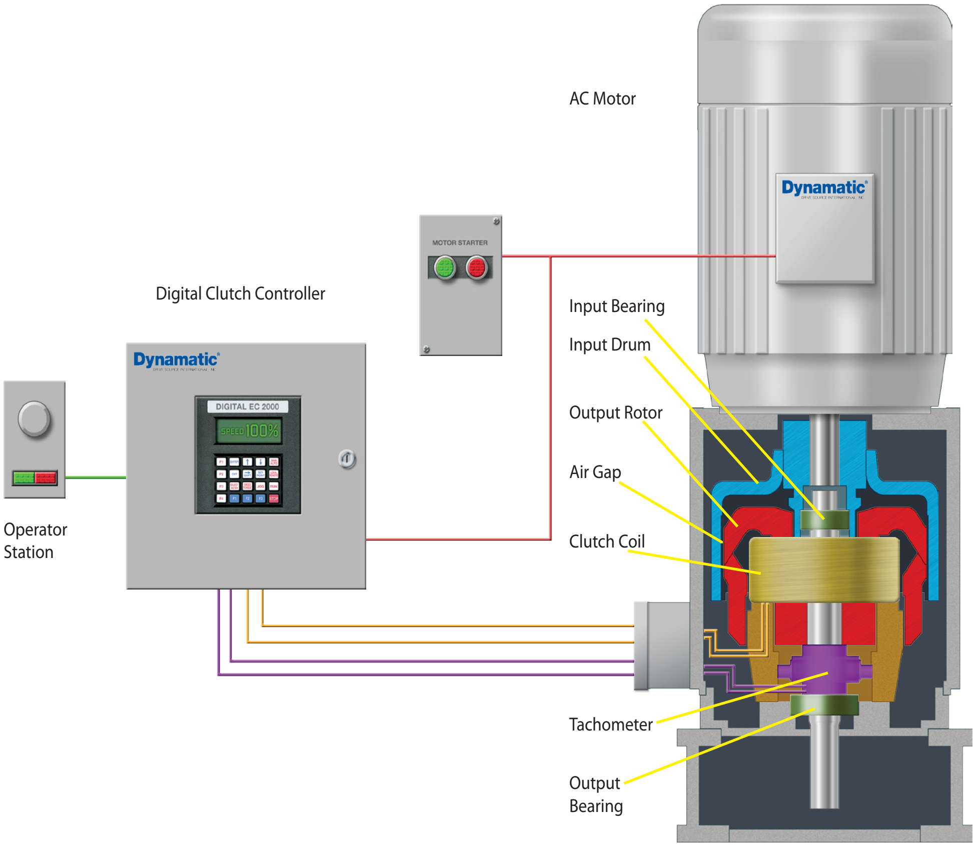
Since the early 1990s, electronic, variable frequency drives have become the commonly prescribed means of variable speed control, and ofter for good reason. Compared to hand-manipulated, mechanical valves and dampers, variable frequency drives can bring significant cost advantages to a broad range of motor control applications.

That said, “variable frequency” is not the only method of controlling “variable speed.” There are other options when it comes to variable speed drive specification. in addition to mechanical drives and variable frequency drives, electromagnetic eddy current drives can, for certain applications, be a more cost-efficient method of variable speed pump control. It all depends on the application and definition of pump-drive system cost efficiency.

Defining Efficiency:

Mark Twain once said that the difference between the right word and the almost right word is the difference between lighting and a lightning bug. Just as “variable frequency” is not the same as “variable speed” the right definition of cost efficiency is important when calculating pump drive systems costs. When cost efficiency is narrowly defined as “energy efficiency” a broader range of costs can go unmeasured.

Governed by today’s most urgent economic reality, a fully informed variable speed drive specification is not limited to a pump system’s energy usage costs but also encompasses initial capital costs and ongoing ownership costs. Return on investment cannot be properly measured without the inclusion of these three cost variables.

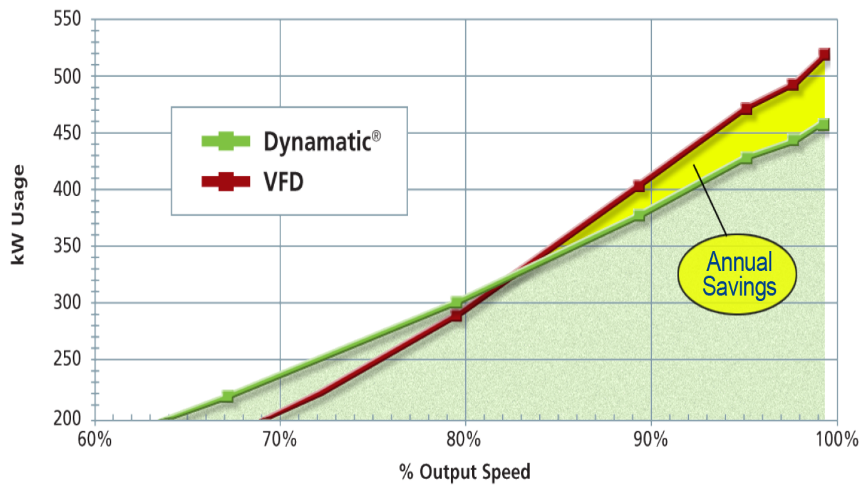


Capital Costs:

Capital costs include application engineering, product procurement, system installation and commissioning. For VFD installations, costs can mount in each of these areas due to system complexity and required ancillary components such as for controlled harmonics and drive system air conditioning. Even so, for many smaller horsepower pumping applications, VFD capital costs will be highly competitive, if not lower than electromagnetic, eddy-current drives.

It is among the larger horsepower pumping applications, beginning around 100 HP, where eddy-current drives offer capital cost savings compared to VFDs. Substantially higher capital cost savings can be achieved in medium voltage applications (2300 volts AC to 4160 volts AC) where the cost of an eddy-current drive can range up to 65% less than the cost of a variable frequency drive. This can mean an outset savings of hundreds of thousands of dollars, and possibly millions, on the purchase of larger drive systems.

In addition, from a plant floor installation standpoint, electromagnetic variable speed drives can be significantly smaller than comparable horsepower, medium voltage VFDs, so they can take up considerable less space.



Energy Costs:

The operating efficiency of an electromagnetic, eddy-current drive increases relative to the normal operating speed of a motor. This makes the drive well suited to most wastewater pumping applications, which typically require controlled speed within the range of from 75% to 100% of the motors rated speed. In contrast, the operating efficiency of a variable frequency drive decreases across this range. In addition VFD related energy costs can be incurred due to the necessary integration of ancillary system components, such as for harmonic dampening and the air-conditioned colling of larger AC drives.

Drive Operation:

The electromagnetic eddy-current variable speed drive system consists of a constant speed AC induction motor and an electromagnetic clutch, governed by a small digital controller. This AC motor runs at its optimum rated speed and the electromagnetic coupling (clutch) is used to vary the output speed.

By regulating voltage to the clutch coil, a magnetic flux field is generated in the gap and distortion of the flux field creates torque. Output speed is governed by the digital control. the feedback signal from a tachometer is compared to a reference signal within the controller to maintain accurate speed within 0.5%. This closed loop-speed system typically uses than 1% of the total AC input current to the motor.

Today's electromagnetic, eddy-current variable speed drives are available with simple yet versatile digital controls options for simplified pump-drive system programming. The new controls can be retrofit to existing drives, and they are compatible with PLC and SCADA system integration.

Gary Patterson holds a BS degree in Electrical Engineering from Michigan Technological University, where he pursued the Power Option, specializing in rotating equipment and electrical power generation, transmission, and distribution. He began his career with a manufacturer of large motors, assigned as a factory application engineer, specializing in the firm's line of eddy current variable speed drives, and their emerging variable frequency drive technology. He served later as a field sales engineer in Chicago, and eventually assumed regional responsibility. He has worked in field sales as a region manager for a variable frequency drive manufacturer, and has also been employed as a sales engineer with a manufacturer's representative firm, responsible for a large variety of electrical and mechanical equipment. He presently serves as the Pump, Fan, and Compressor Technical Specialist for Dynamatic, focusing on pumping and similar applications in the industrial and municipal markets.